PATENT ABSTRACTS OF JAPAN

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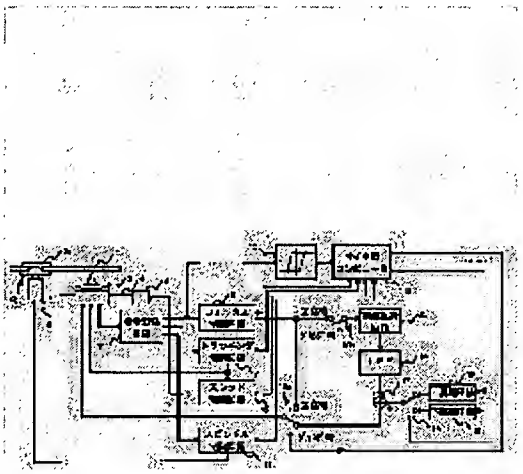
(54) OPTICAL DISK DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To control acceleration voltage properly stably against wobbling and noise at the time of layer jump by eliminating high-frequency components such as noise of a driving signal and detecting zero-crossing point of a focussing error signal with histeresis.



SOLUTION: A driving signal for a pickup 3 from a focus control circuit 8 is inputted in LPF 14 through a changeover switch 19b. Then, high frequency components such as noise are eliminated but low frequency such as wobbling are not, with the signal supplied to an adder 17. In the movement to other focussing point on a recording surface, a micro computer 13 switches the changeover switch 19a, 19b to the jump side, setting the rising/falling voltage of a specific value in a circuit 15, 16 for setting such voltage value. After that, it is switched to the rising voltage side and supplied to the pickup 3. Then, a focus zero crossing detector 12 detects the zero crossing point of a focussing error signal with histeresis, switching it to the falling voltage side by the micro computer 13. Consequently, the focusing point is surely moved.

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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] In the optical disk unit with which two or more layers which have a recording surface in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, The migration means for moving an objective lens in the direction perpendicular to the recording surface of a disk, and doubling the focus of an objective lens with the recording surface of a disk (3), A means to remove the noise component of a signal which makes an objective lens drive (14), The means which switches the fixed electrical-potential-difference value which makes an objective lens required in order to bring an objective lens close to a disk front face temporarily drive, and the fixed electrical-potential-difference value which makes an objective lens required in order to keep away drive (18), To the signal which makes the objective lens from which the noise component was removed drive, the account of a top by bringing an objective lens close to a disk front face temporarily, or keeping it away from a means (17) to add the switched fixed electrical-potential-difference value, and a layer with a certain recording surface The above-mentioned layer switches to a means (12) for the layer produced when moving to a layer with another recording surface to switch, and to detect a point. By the detecting signal from the detection means of a point A means to control the means which switches the electrical-potential-difference value of the above-mentioned regularity, and (13) are provided. Two or more layers which have a recording surface in field of one of the two the signal which added the fixed electrical-potential-difference value to the driving signal of the objective lens from which the noise component was removed from the focusing point of the recording surface of a certain layer by giving the migration means of an objective lens to a certain disk The optical disk unit characterized by moving an objective lens to another layer compulsorily, controlling the fixed electrical-potential-difference value which the above-mentioned layer produced in the case of this migration switches, and is given to the migration means of an objective lens in a point, and drawing an objective lens in the focusing point of the recording surface of another layer.
[Claim 2] A means (12) for said layer produced in case an objective lens moves to the layer which has another recording surface from a layer with a certain recording surface in claim 1 publication to switch, and to detect a point is an optical disk unit characterized by having a hysteresis and detecting the zero crossing point of the serpentine curve of the focal error signal in an astigmatism method.
[Claim 3] Said means (13) to control the means which switches said fixed electrical-potential-difference value in claim 1 publication Until said layer switches and a point is detected, when moving to another back layer from a disk front face If it switches to the fixed electrical-potential-difference value which makes an objective lens drive so that it may bring close to a disk, and a layer switches and a point is detected It controls to switch to the fixed electrical-potential-difference value which makes an objective lens drive so that it may keep away from a disk. Moreover, until said layer switches and a point is detected, when moving to another surface layer from the disk back The optical disk unit characterized by controlling to switch to the fixed electrical-potential-difference value which makes an objective lens drive so that it may keep away from a disk, and to switch to the fixed electrical-potential-difference

value which makes an objective lens drive so that it may bring close to a disk if a layer switches and a point is detected.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical disk unit which reproduces or reproduces [record] a signal more nearly optically than a disk, and relates to the optical disk unit which it is reproducible or can record play the disk which has a recording surface more than two-layer in field of one of the two especially.
[0002]
[Description of the Prior Art] A disk an one side monolayer, a double-sided monolayer, one side two-layer, and double-sided two-layer exists in current and the digital video disc (hereafter referred to as DVD) standardized. Although there was only an one-layer recording surface in one side as for an old disk (hereafter referred to as CD), for example, a compact disk, a laser disc (hereafter referred to as LD), etc., in order to enlarge storage capacity, with DVD, the two-layer disk (it is only hereafter called a two-layer disk) which has two recording surfaces in one side exists.
[0003] (a) of drawing 2, and (b) -- ** -- it is drawing showing a two-layer disk [like]. Drawing 2 (a) makes the recording surface to each of the 0.6mm disk of two sheets, and shows the single-sided two-layer disk which makes the disk which attached the high reflection factor film of aluminum, and the disk which attached the reflective film of translucent gold come to rival with a sufficient precision. Moreover, (b) of drawing 2 shows the double-sided two-layer disk which two-sheet precision improved information multiplex [of the 0.6mm disk] in lamination and the depth direction of the disk made to rival.
[0004] As in the case of this two-layer disk information is recorded on the recording surface of each layer and it is shown in (d) of drawing 2 In the focal error signal shown in (c) of drawing 2 the driving signal of pickup -- gradually -- raising (supposing that it goes up in the direction in which an objective lens also approaches a disk, if the driving signal of pickup is raised in this case) -- If the point (it is hereafter called a focusing point) that the focus of a lower layer (it is hereafter called a 0 horizon eye) is correct appears in the location of a certain pickup and raises pickup further It appears further in the upper location from the location of pickup of the focusing point of the upper layer (it is hereafter called the 1st layer) of a 0 horizon eye. In short, in the case of a two-layer disk, it is making the location of pickup go up and down, and it doubles the focusing point for every layer, respectively.
[0005] Neither in CD nor LD, although what is necessary is just to double a focusing point with the only recording surface of one side, if a focusing point is not moved to the recording surface of other layers from the recording surface of the layer which is already in a focusing point, in the case of the two-layer disk which has two fields where information was recorded on one side like the above-mentioned DVD, the information on which other layers are recorded can be read. As for the focusing point migration between this layer (it is hereafter called a layer jump), it is common to apply a rise electrical potential difference and a downward electrical potential difference to pickup driver voltage, and to shift and move the location of pickup delicately. In addition, such a conventional technique is indicated by 66 pages of "the book which all the DVDs understand" (Nippon Jitsugyo Publishing, Yojiro Ikawa work).

[0006]
[Problem(s) to be Solved by the Invention] In the above-mentioned conventional technique, although the location of pickup is moved from the condition of being already in a focusing point, by applying a rise electrical potential difference and a downward electrical potential difference to the driver voltage of pickup in case a layer jump is performed in other layers, about how to apply these electrical potential differences, it is not written clearly.
[0007] By the way, although pickup is moved to other layers from the condition of being already in a focusing point in order to perform a layer jump, the following problems arise at this time.
(1) Although a rise electrical potential difference and a downward electrical potential difference are impressed to pickup driver voltage, if the value of this applied voltage is large, pickup will move more than an assumption, the focusing point of other layers will also be exceeded far, and if conversely small, it will not reach by the focusing point of other layers.
(2) In order that the driver voltage of pickup may always double with a focusing point to field blurring of a disk, synchronizing with field blurring, it is shaken up and down.
(3) Since the noise component of those [many] is also in the driver voltage of pickup, in case a rise electrical potential difference and a downward electrical potential difference are impressed, it will be greatly influenced of a noise.
[0008] The place which it was made in order that this invention might solve the above-mentioned problem, and is made into the purpose In case a layer jump is performed, it carries out also to a noise also to field blurring as [impress / an always proper rise electrical potential difference or a downward electrical potential difference]. Moreover, it controls by a layer switching a rise electrical potential difference and a downward electrical potential difference required moving to other layers, and detecting a point appropriately, and is in offering the optical disk unit which can perform a layer jump stably.
[0009]
[Means for Solving the Problem] In the optical disk unit with which two or more layers which have a recording surface in field of one of the two reproduce or play [record] a certain disk optically in order that this invention may attain the above-mentioned purpose The objective lens for doubling the focus of a laser beam with the recording surface of a disk, The migration means for moving an objective lens perpendicularly mostly to a disk side, and doubling the focus of an objective lens with the recording surface of a disk, A means to generate a focal error signal from the signal acquired from an objective lens, The focal control means which generates the pickup driving signal (focal driving signal) for setting an objective lens by the focusing point from a focal error signal, The low pass filter from which the noise component of a focal driving signal is removed, and a means to add the fixed electrical potential difference for moving an objective lens delicately, A means to control or or the switch of an electrical potential difference of whether to carry out descent which raises pickup, A means for the layer of a recording surface to switch from a focal error signal, and to detect a point, It provides, and in case it moves to the focusing point of other layers from the layer which is already in a focusing point, it constitutes so that a rise electrical potential difference and a downward electrical potential difference may be added to the pickup driving signal which removed the noise component, the layer of a recording surface may switch and a rise electrical potential difference and a downward electrical potential difference may be switched at a point. Thereby, a layer jump can be carried out to stability, without being influenced of face deflection or a noise.
[0010]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained using a drawing. Drawing 1 is the block diagram showing the configuration of the optical disk unit concerning 1 operation gestalt of this invention. In drawing 1 a recording surface for 1 a certain disk and 2a more than two-layer in one side A clamper, 2b pickup and 4 for a turntable and 3 A leading screw, In 5, a thread motor and 6 a digital disposal circuit and 8 for a spindle motor and 7 A focal control circuit, 9 a thread control circuit and 11 for a tracking control circuit and 10 A spindle control circuit, A focal zero cross detector and 13 12 A microcomputer (It is hereafter called a microcomputer) and 14 A low pass filter (hereafter referred to as LPF), 15 -- for an adder and 18, an electrical-potential-difference transfer switch

and 19a of a transfer switch and 19b are [a rise electrical-potential-difference value setting circuit and 16 / a downward electrical-potential-difference value setting circuit and 17 / a transfer switch and 26] last value holding circuits.

[0011] Next, actuation of this operation gestalt is explained. It is fixed to turntable 2b by clamper 2a, and the disk 1 set on turntable 2b is that a spindle motor 6 rotates, and rotates a disk 1.

[0012] In order to read the information on a disk 1, a microcomputer 13 supplies a luminescence control signal to the semiconductor laser in pickup 3.

[0013] The semiconductor laser of pickup 3 and the example of a configuration of optical system, and the example of a configuration of the focal error signal detection means of a digital disposal circuit 7 are shown in drawing 3 .

[0014] For half prism and 22, as for a condenser lens and 24, in drawing 3 , semiconductor laser and 23 are [20 / an objective lens and 21 / a photodetector and 25] error computing elements (error amplifier).

[0015] The flux of light which semiconductor laser 22 emits passes the half prism 21, has focused with an objective lens 20, and connects the beam spot on a disk 1. It passes along an objective lens 20 again, and is reflected by the half prism 21, and the laser reflected light from a disk 1 passes a condenser lens 23, and connects a spot to a photodetector 24.

[0016] The example of a concrete configuration of the detection sake of the focal error signal in the above-mentioned photodetector 24 is explained. As shown in drawing 3 , a photodetector 24 consists of four area A, B, C, and D, on the diagonal line, constructs a pair and is connected electrically.

[0017] If the location of a photodetector 24 is placed so that the beam spot which carries out incidence to a photodetector 24 may become a circle when a disk 1 and an objective lens 20 are in a focal location, the output which amplified the addition output of the photodetector 24 on the diagonal line with the error amplifier 25 will serve as zero. Here, if the beam spot which carries out incidence to a photodetector 24 uses becoming longwise or oblong when a disk 1 shifts up and down to the focal location of an objective lens 20, from the error amplifier 25, the focal error signal according to the amount of gaps and the direction shifted of [from a focal location] as shown in drawing 4 will be detected (the so-called astigmatism method).

[0018] In drawing 4 , an axis of abscissa is the distance of an objective lens and a disk, and an axis of ordinate is signal level. The serpentine curve of a focal error signal has the description which carries out a zero cross at the point whose focus of an objective lens suited to the disk recording surface. In addition, although there may be a polarity of this serpentine curve also when [to the error computing element 25] becoming reverse by the difference in an input, it cannot be overemphasized that it should just have reverse a view of the disk displacement by signal level in the case of such a system.

[0019] The focal error signal generated with the error computing element 25 is supplied to the focal control circuit 8, and generates and outputs the driving signal of pickup 3 for the feedback control near [in the serpentine curve of a focal error signal] a zero cross point in this focal control circuit 8. This output signal is supplied to transfer-switch 19a. By the command of a microcomputer 13, at the time of a stationary, transfer-switch 19a has switched to the stationary side, and supplies as a driving signal of pickup 3. Pickup 3 is controlled by the driving signal of this pickup 3 in the vertical direction, focal control of the feedback loop is realized, and the condition of being always in a focusing point is maintained.

[0020] On the other hand, the tracking error signal generated by the digital disposal circuit 8 is supplied to the tracking control circuit 9, and generates the driving signal for the feedback control of the direction of tracking of pickup 3 in the tracking control circuit 9. The driving signal of this pickup 3 is supplied to the pickup 3 interior, thereby, pickup 3 is minutely controlled in the direction of tracking, and realizes tracking control of the feedback loop, and maintains the condition of being always on the pit in the recording surface of a disk 1.

[0021] Moreover, the driving signal outputted from the tracking control circuit 9 is supplied also to the thread control circuit 10, it generates the driving signal which controls the thread motor 6 according to a gap in the direction of tracking of pickup 3 in this thread control circuit 10, supplies this to the thread motor 6, and operates the thread motor 6.

[0022] Moreover, in a digital disposal circuit 7, the rotation period information read in the disk 1 is supplied to the spindle control circuit 11, the signal which drives a spindle motor 6 in the spindle control circuit 11 based on this rotation period information is generated, and a spindle motor 6 is supplied.
[0023] It is in the condition by which the above is on a focusing point at the time of a stationary, and a focus, tracking, the spindle, and the thread were controlled.
[0024] Here, when it is the single-sided two-layer disk of DVD which the disk 1 mentioned above, a focusing point location may have to be switched to the layer of another recording surface from the layer of the recording surface which is now. For example, the location of pickup 3 is on the focusing point of the recording surface of a 0 horizon, and the case where a focusing point is jumped in the upper layer (one layer) from a lower layer (0 horizon) is explained [that is,] to bring a focusing point to the recording surface of one layer from this condition.
[0025] First, the driving signal of the pickup 3 which the focal control circuit 8 in the condition of being on the focusing point of the recording surface of a 0 horizon by the steady state until now outputs is supplied to transfer-switch 19b, in the case of the steady state, transfer-switch 19b has switched at the stationary side, and the driving signal of the pickup 3 which the focal control circuit 8 outputs is supplied to the before value holding circuit 26 as it is. In the last value holding circuit 26, that value is always held until a value changes, and this held value is supplied to LPF14.
[0026] In LPF14, although removed, the high-frequency component (noise component) of the signal which drives pickup 3 has frequency characteristics which are not removed, and a low-pass component like the face deflection mentioned later mainly removes a noise component, and it supplies it to an adder 17. Actuation to LPF14 which has mentioned above at the time of a stationary is always performed.
[0027] Here, in case it moves to the focusing point of the recording surface of one layer, a microcomputer 13 switches transfer switches 19a and 19b to a jump side. Thereby, since transfer-switch 19b becomes open, the feedback loop which was controlling the former pickup 3 turns into open-loop, and control is cut. Moreover, since it goes up to the recording surface of one layer, a microcomputer 13 sets the rise electrical-potential-difference value and downward electrical-potential-difference value of constant value as the rise electrical-potential-difference value setting circuit 15 and the downward electrical-potential-difference value setting circuit 16. A microcomputer 13 issues directions further again so that the electrical-potential-difference transfer switch 18 may be switched to a rise electrical-potential-difference value side.
[0028] The output from the above-mentioned rise electrical-potential-difference value setting circuit 15 is supplied to an adder 17. And the signal and rise electrical-potential-difference value which removed the high region noise component are added and outputted with an adder 17 by LPF14, and transfer-switch 19a is supplied. Since this transfer-switch 19a has switched to the jump side, the above-mentioned addition signal supplied to transfer-switch 19a passes transfer-switch 19a, and is supplied to pickup 3.
[0029] Pickup 3 begins a rise by the driver voltage to which the rise electrical-potential-difference value was added by this. Here, the focal error signal outputted from the digital disposal circuit 7 is supplied to the focal zero cross detector 12, the point that a focal error signal crosses zero (core) in this focal zero cross detector 12 is detected, and a microcomputer 13 is supplied. If the point which carries out a zero cross is detected, directions will be taken out with a microcomputer 13 so that a downward electrical-potential-difference value may be set as the downward electrical-potential-difference value setting circuit 16 and the electrical-potential-difference transfer switch 18 may be switched to a downward electrical-potential-difference value side. At this time, the time amount (time amount A) which impressed the rise electrical-potential-difference value is measured with the microcomputer 13.
[0030] The output from the above-mentioned downward electrical-potential-difference value setting circuit 16 is supplied to an adder 17. And the signal and downward electrical-potential-difference value which removed the high-frequency component are added and outputted with an adder 17 by LPF14. Since it was the midst which is carrying out the layer jump at this time, transfer switches 19a and 19b have switched to the jump side. The above-mentioned addition signal supplied to transfer-switch 19a passes transfer-switch 19a, is supplied to pickup 3, and drops pickup 3 shortly by this. It serves to stop

the rise of pickup 3, impression of this downward electrical-potential-difference value impressing the electrical potential difference of hard flow to the pickup 3 which was going up till then, and applying brakes. After impressing a fixed time amount downward electrical-potential-difference value of the multiple time amount (time amount AxK;K is a constant) of the time amount which impressed the rise electrical-potential-difference value, in order to double with a focusing point at the recording surface of one layer, a microcomputer 13 switches transfer switches 19a and 19b to a stationary side.

[0031] Thereby, control of the pickup 3 which had become open-loop turns into control by the feedback loop using a focal error signal again, and feedback control is carried out so that it may be drawn in the focusing point of the recording surface of one layer.

[0032] By actuation mentioned above, it will be in the condition of being in the focusing point of one layer from the condition which is in the focusing point of the recording surface of a 0 horizon.

[0033] The situation of the layer jump actuation mentioned above is explained using drawing 5 . (a) of drawing 5 and (b) show the focal error signal at the time of descent, the driving signal of pickup 3, and the switch polarity of transfer switches 19a and 19b at the time of a rise, an axis of abscissa is time amount and an axis of ordinate is an electrical-potential-difference value. In this case, if a pickup driver voltage value is raised, pickup 3 will go up, and if a pickup electrical-potential-difference value is lowered, pickup 3 shall descend.

[0034] The focal error signal of the condition that (a) of drawing 5 is in a focusing point by the recording surface of a lower layer (0 horizon) by the case where the location of a focusing point is raised from a 0 horizon to one layer is near the zero mostly. In this case, the pickup driving signal has also required control of the feedback loop, and it becomes fixed with a certain electrical-potential-difference value.

[0035] Here, if transfer switches 19a and 19b are made into a jump side from a stationary side, control of the feedback loop will go out and a fixed rise electrical potential difference will be impressed to coincidence. Then, since pickup 3 begins a rise, the focusing point in a 0 horizon separates and goes, and a focal error signal goes down a trough. This trough will be crossed if a rise is furthermore continued. If it furthermore continues applying a rise electrical potential difference, a focal error signal will go up a trough and a zero crossing point will appear. In this zero crossing point, a rise electrical potential difference is switched to a downward electrical potential difference. Moreover, the time amount (time amount A) which impressed the rise electrical potential difference is measured with a microcomputer 13.

[0036] Although the acceleration of the pickup 3 produced with the rise electrical potential difference consists of a rise in the downward direction by impression of a fixed downward electrical potential difference, pickup 3 continues a rise and begins stop descent soon for the time being. It stops impressing a downward electrical potential difference after the multiple time amount (time amount AxK;K is a constant) of the time amount which impressed the rise electrical potential difference, and transfer switches 19a and 19b are switched to a stationary side. At this time, since pickup 3 is near the point focusing [of the 1st layer], it performs focal control of the feedback loop by the focal error signal, and draws it in the focusing point of the recording surface of the 1st layer.

[0037] Similarly, the focal error signal of the condition that (b) of drawing 5 is in a focusing point by the recording surface of the upper layer (one layer) by the case where the location of a focusing point is dropped to a 0 horizon from one layer is near the zero mostly. In this case, the pickup driving signal has also required control of the feedback loop, and it becomes fixed with a certain electrical-potential-difference value.

[0038] Here, if transfer switches 19a and 19b are made into a jump side from a stationary side, control of the feedback loop will go out and a fixed downward electrical potential difference will be impressed to coincidence. Then, since pickup 3 begins descent, the focusing point in one layer separates and goes, and a focal error signal goes up a crest. This crest will be crossed if descent is furthermore continued. If it furthermore continues applying a downward electrical potential difference, a focal error signal will get down from a crest, and a zero crossing point will appear. In this zero crossing point, a downward electrical potential difference is switched to a rise electrical potential difference. Moreover, the time

amount (time amount A) which impressed the downward electrical potential difference is measured with a microcomputer 13.

[0039] Although the acceleration of the pickup 3 produced with the downward electrical potential difference consists of descent in the rise direction by impression of a fixed rise electrical potential difference, pickup 3 continues descent and begins a stop rise soon for the time being. It stops impressing a rise electrical potential difference after the multiple time amount (time amount AxK;K is a constant) of the time amount which impressed the downward electrical potential difference, and transfer switches 19a and 19b are switched to a stationary side. At this time, since pickup 3 is near the focusing point of a 0 horizon eye, it performs focal control of the feedback loop by the focal error signal, and draws it in the focusing point of the recording surface of a 0 horizon eye.

[0040] In addition, it cannot be overemphasized that what is necessary is just to think that, as for how depending on which the crest of the focal error signal mentioned above and a trough appear, the direction becomes reverse by appearing in that case although it may completely become reverse with the polarity of the error computing element 25 as mentioned above.

[0041] In this operation gestalt, as stated also in advance, the rise electrical-potential-difference value and the downward electrical-potential-difference value are impressed to an output signal from the focal control circuit 8. This is for not being influenced of face deflection. There is a phenomenon called face deflection in a disk 1, and this is the case where a disk 1 has not a flat surface but curvature, and a curve completely, the effect of the mechanical precision of turntable 2b, etc., and when the disk side of the disk with which it equipped is not perpendicular to the revolving shaft of a spindle motor 6, it is generated.

[0042] If there is the above-mentioned face deflection in order that the distance from the location of the objective lens of pickup 3 to the recording surface of a disk may always control by the condition of being in a focusing point, uniformly, a focal error signal will appear so that face deflection may be met and it may lenticulate. That is, the location of pickup 3 also lenticulates. If a rise electrical-potential-difference value and a downward electrical-potential-difference value are impressed to the focal error signal when being in a focusing point in case a layer jump is carried out since the distance from the condition which is in a focusing point in the layer which is now to the focusing point of another layer is fixed, a rise and descent of a constant rate can be performed from a focusing point.

[0043] The situation is shown in (a) of drawing 6 , and (b). An axis of abscissa is time amount and an axis of ordinate is the electrical-potential-difference value of a focal error signal. As shown in (a) of drawing 6 , when it is in the component of the trough of face deflection, a rise electrical-potential-difference value and a downward electrical-potential-difference value are impressed from the location, and as shown in (b) of drawing 6 , when it is in the component of the crest of face deflection, a rise electrical potential difference and a downward electrical potential difference are impressed from the location. Thereby, the stable layer jump can be realized, without being influenced of the face deflection of a disk 1.

[0044] Moreover, although the rise electrical potential difference and the downward electrical potential difference are added to what removed the high-frequency component (noise component) for the driving signal of the pickup 3 generated from the focal error signal in the focal control circuit 8 by LPF14 with this operation gestalt as stated also in advance, the effectiveness by letting this LPF14 pass is explained.

[0045] (a) of drawing 7 and (b) are the cases where a rise electrical potential difference is impressed to an output signal from the focal control circuit 8 which does not let LPF14 pass. Although the electrical potential difference is impressed to this noise component at drawing 7 (a) in the condition that the noise is added to the main electrical-potential-difference value of an output signal, if an electrical potential difference is impressed to the part of the trough of a noise component, a low value will be impressed in fact than the impressed electrical-potential-difference value, and pickup 3 cannot fully be raised. Moreover, conversely as shown in (b) of drawing 7 , if an electrical potential difference is impressed to the part of the crest of a noise component, a high value will be impressed in fact than the impressed electrical-potential-difference value, pickup 3 will be raised beyond the need, and acceleration to the extent that the focusing point of the following layer is also exceeded will be given. That is, the

electrical-potential-difference value impressed under the effect of a noise does not become fixed.
[0046] Then, by letting LPF14 which removes the noise component of a high region pass, since a rise electrical potential difference can always be impressed to a main electrical-potential-difference value as shown in (c) of drawing 7 , acceleration by the electrical-potential-difference impression to pickup 3 can be made regularity, and the stable layer jump can be realized. However, although the face deflection component low-pass [above-mentioned] has frequency characteristics which are not removed and LPF14 does not remove a face deflection component, the noise component of a high region removes it.
[0047] Furthermore, in this operation gestalt, although the focal zero cross detector 12 detects the point which crosses the zero (core) of a focal error signal, it detects the location of this core with a hysteresis. That is, let the location which shifted from the core be a zero crossing point. It detects having moved to certainly another layer by making the bottom or a top into a zero crossing point more nearly further than an original zero crossing point with [it is difficult to detect whether in order for there to be a flat part by the time the focus error signal in the focus error signal in a 0 horizon to one layer appears, as this shows (a) of drawing 8 , and to be further influenced of a noise, the layer changed by the focal zero crossing point, and] a hysteresis.
[0048] In the mimetic diagram of the layer jump shown by drawing 5 , it is the situation of the layer jump at the time of having a hysteresis in the focal zero cross detector 12 which is shown in drawing 8 . (a) of drawing 8 and (b) show the focal error signal at the time of descent, the pickup driving signal, and the switch polarity of transfer switches 19a and 19b at the time of a rise, an axis of abscissa is time amount and an axis of ordinate is an electrical-potential-difference value. Moreover, a dotted-line part is the amount of hystereses of the focal zero cross detector 12.
[0049] By the case where a focal location is raised, (a) of drawing 8 impresses a rise electrical potential difference as mentioned above, and raises pickup 3. Although a focal error signal will go up a trough and a zero crossing point will appear if it furthermore continues applying a rise electrical potential difference, this zero crossing point detects a zero crossing point above a center position by the hysteresis of the focal zero cross detector 12. In a zero crossing point with this hysteresis, a rise electrical potential difference is switched to a downward electrical potential difference. And focal control of the feedback loop by the focal error signal is performed near the focusing point of the recording surface of the 1st layer, and it draws in the focusing point of the recording surface of the 1st layer.
[0050] By the case where a focal location is dropped, (b) of drawing 8 impresses a downward electrical potential difference as mentioned above, and drops pickup 3. Although a focal error signal will get down from a crest and a zero crossing point will appear if it furthermore continues applying a downward electrical potential difference, this zero crossing point detects a zero crossing point below a center position by the hysteresis of the focal zero cross detector 12. In a zero crossing point with this hysteresis, a downward electrical potential difference is switched to a rise electrical potential difference. And focal control of the feedback loop by the focal error signal is performed near the focusing point of the recording surface of a 0 horizon eye, and it draws in the focusing point of the recording surface of a 0 horizon eye.
[0051] By zero crossing point detection with the hysteresis of the focal zero cross detector 12 which was described above, it can detect having approached the layer carrying out a layer jump certainly, without being influenced of a noise, and a downward electrical potential difference or a downward electrical potential difference to a rise electrical potential difference can be switched from a suitable rise electrical potential difference.
[0052] Although a microcomputer 13 performs each control at the time of the above layer jump, the PAD diagram of the algorithm of the control in that case is shown in drawing 9 . A layer jump can control by this algorithm to stability with a microcomputer 13.
[0053] A rise electrical potential difference required to move to other layers or a downward electrical potential difference is controlled by carrying out as [impress / always proper acceleration voltage] also to a noise also to field blurring, and a layer switching, and detecting a point appropriately, in case a layer jump is performed according to this operation gestalt, as explained above, and the optical disk unit which can perform a layer jump stably can be realized.

[0054]
[Effect of the Invention] According to above this invention, the following effectiveness is done so.
(1) In case a layer jump is performed, impression of always proper acceleration voltage is enabled also to a noise also to field blurring, and a layer jump can be performed stably.
(2) A layer can switch, a point can be detected and acceleration voltage required to move to other layers can be controlled.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the configuration of the optical disk unit concerning 1 operation gestalt of this invention.
[Drawing 2] It is the explanatory view showing the outline of a two-layer disk and a layer jump.
[Drawing 3] It is the explanatory view showing the semiconductor laser of pickup and the example of a configuration of optical system, and the example of a configuration of the focal error signal detection means of a digital disposal circuit.
[Drawing 4] It is the explanatory view showing the focal error signal over disk displacement.
[Drawing 5] It is the explanatory view showing the focal error signal and pickup driving signal at the time of a layer jump.
[Drawing 6] It is the explanatory view showing a face deflection component and applied voltage.
[Drawing 7] It is the explanatory view showing a noise component and applied voltage.
[Drawing 8] It is the explanatory view showing the focal error signal and pickup driving signal in a layer jump at the time of the zero cross detection with a hysteresis.
[Drawing 9] It is the explanatory view showing the example of the layer jump control algorithm in a microcomputer.
[Description of Notations]
1 Recording Surface is a Certain Disk More Than Two-layer to One Side.
2a Clamper
2b Turntable
3 Pickup
4 Leading Screw
5 Thread Motor
6 Spindle Motor
7 Digital Disposal Circuit
8 Focal Control Circuit
9 Tracking Control Circuit
10 Thread Control Circuit
11 Spindle Control Circuit
12 Focal Zero Cross Detector
13 Microcomputer (Microcomputer)
14 Low Pass Filter (LPF)
15 Rise Electrical-Potential-Difference Value Setting Circuit
16 Downward Electrical-Potential-Difference Value Setting Circuit
17 Adder
18 Electrical-Potential-Difference Transfer Switch
19a Transfer switch
19b Transfer switch

20 Objective Lens
21 Half Prism
22 Semiconductor Laser
23 Condenser Lens
24 Photodetector
25 Error Computing Element
26 Last Value Holding Circuit

[Translation done.]

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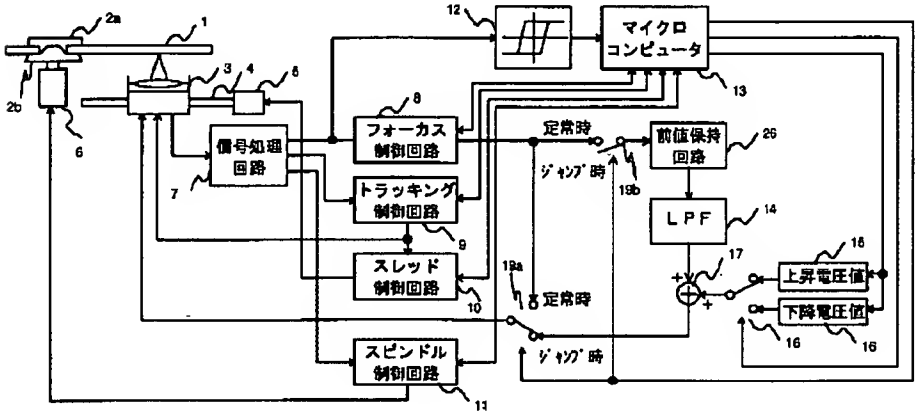
DRAWINGS

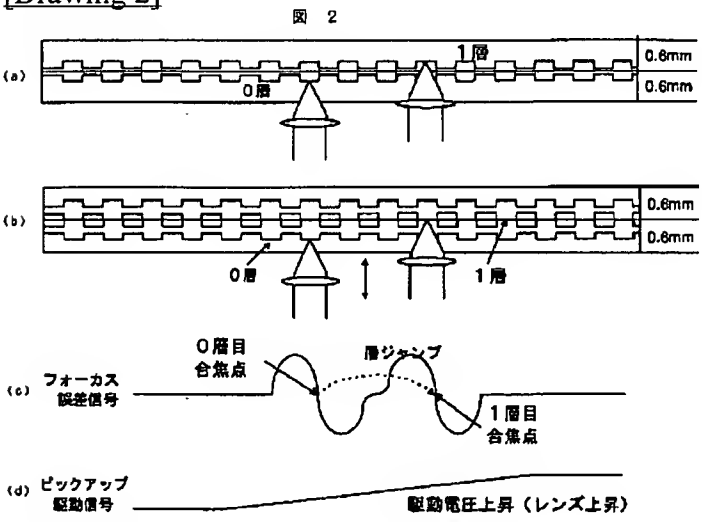
[Drawing 1]

図 1



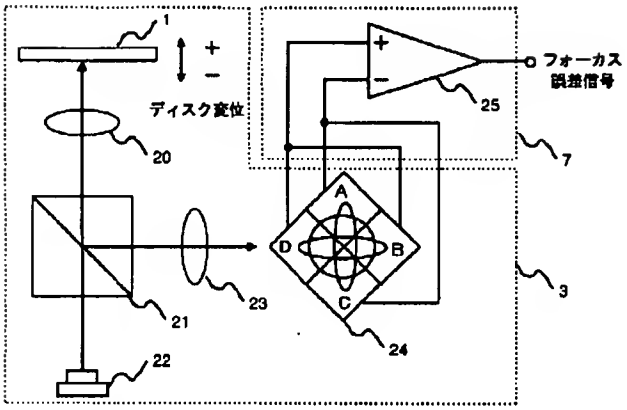
[Drawing 2]

図 2



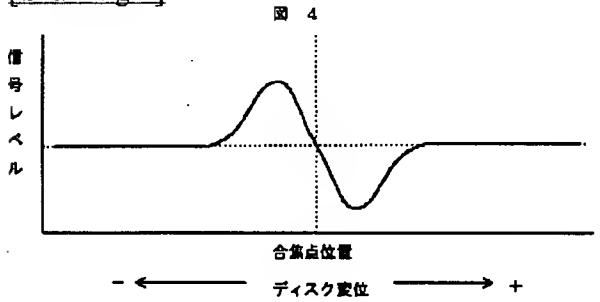
[Drawing 3]

図 3



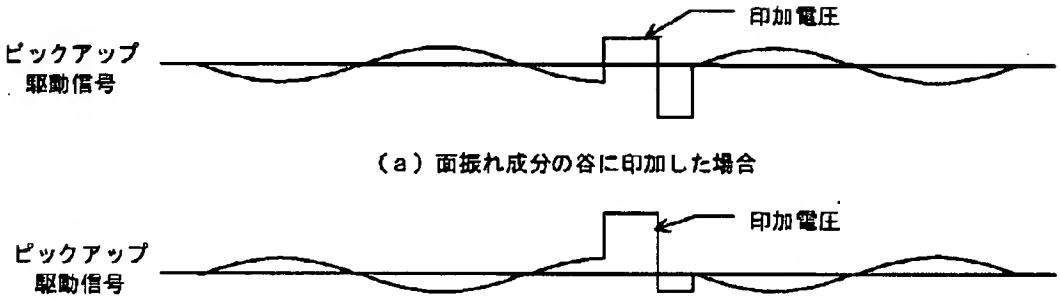
[Drawing 4]

図 4



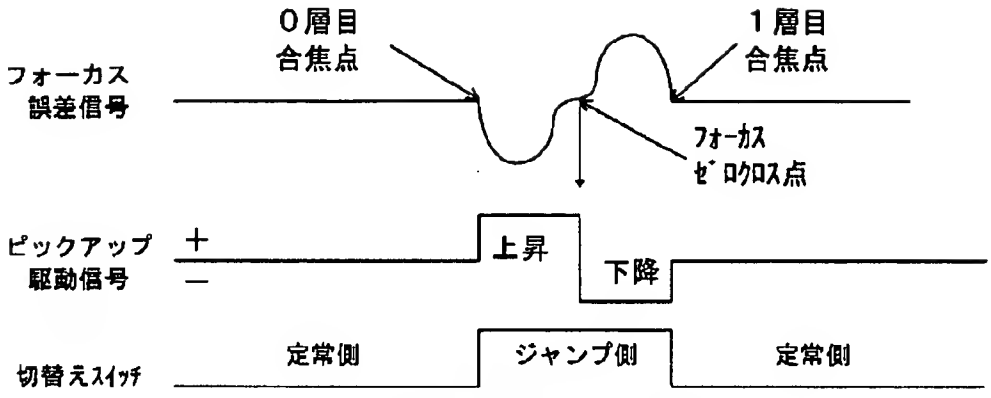
[Drawing 6]

図 6

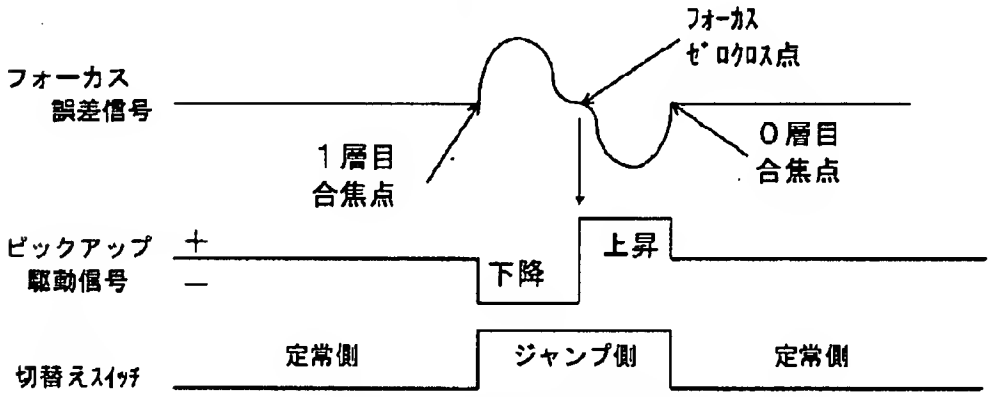


[Drawing 5]

図 5



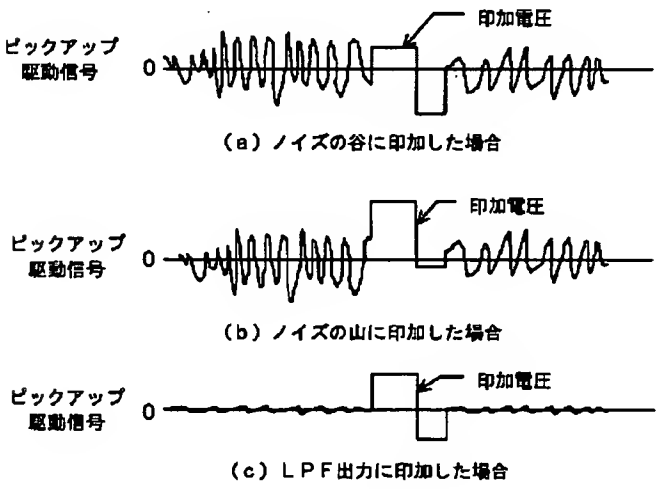
（a）0層から1層への層ジャンプ



（b）1層から0層への層ジャンプ

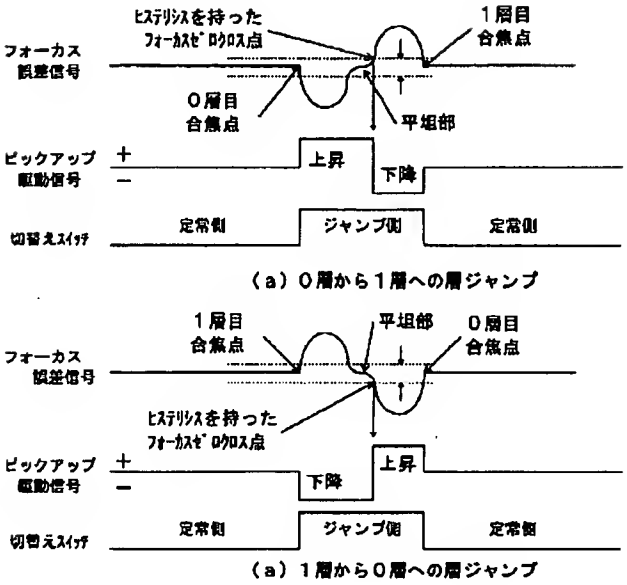
[Drawing 7]

図 7



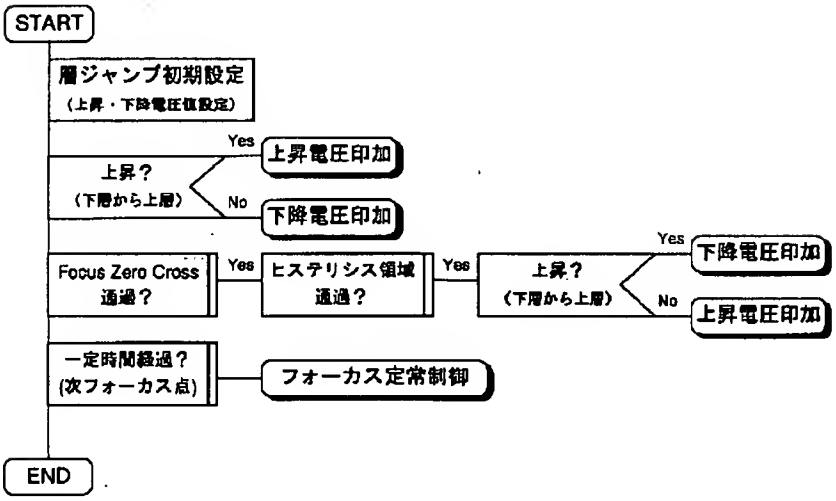
[Drawing 8]

図 8



[Drawing 9]

図 9



[Translation done.]

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CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
[Section partition] The 4th partition of the 6th section
[Publication date] March 15, Heisei 14 (2002. 3.15)

[Publication No.] JP,10-124883,A
[Date of Publication] May 15, Heisei 10 (1998. 5.15)
[Annual volume number] Open patent official report 10-1249
[Application number] Japanese Patent Application No. 8-276246
[The 7th edition of International Patent Classification]

G11B 7/085

[FI]

G11B 7/085 B

[Procedure revision]
[Filing Date] August 27, Heisei 13 (2001. 8.27)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] The objective lens for doubling the focus of a laser beam with the recording surface of an optical disk,
The driving means which makes this objective lens drive in the direction of a focus,
The focal control means which outputs the signal for carrying out focal control of said driving means based on the detected focal error signal,
The value maintenance means before holding the output signal of this focal control means,
A driver voltage value supply means to supply the rise electrical-potential-difference value which orders the rise drive of said objective lens, or the downward electrical-potential-difference value which orders a downward drive to said driving means,
The low pass filter which passes the low-pass signal of the output signal of said before value maintenance means,
The optical disk unit characterized by establishing an addition means to add said rise electrical-potential-difference value or said downward electrical-potential-difference value to the output signal of a value maintenance means before [said] letting this low pass filter pass.
[Claim 2] In an optical disk unit according to claim 1,

Said optical disk is an optical disk which has two or more recording layers in one side,
Furthermore, the optical disk unit characterized by having a focal zero cross detection means to detect the change rate of said recording layer by having a hysteresis and detecting the zero crossing point of the serpentine curve of the focal error signal in an astigmatism method.
[Claim 3] In an optical disk unit according to claim 1 or 2,
Said rise electrical-potential-difference value or said downward electrical-potential-difference value is switched, and it has an electrical-potential-difference value switch means to output to said addition means,
This electrical-potential-difference value switch means,
Until it detects the change rate of said recording layer, when making a focusing point jump from one recording layer in one side of said optical disk to other recording layers which adjoin this Said rise electrical-potential-difference value according to the aforementioned jump direction, Or the optical disk unit characterized by controlling said downward electrical-potential-difference value whose point is the driver voltage value of hard flow, or said rise electrical-potential-difference value to output to said addition means if said downward electrical-potential-difference value is outputted to said addition means and the change rate of said recording layer is detected.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0009
[Method of Amendment] Modification
[Proposed Amendment]
[0009]
[Means for Solving the Problem] In one typical invention of the optical disk unit by this application The objective lens for doubling the focus of a laser beam with the recording surface of an optical disk, The driving means which makes this objective lens drive in the direction of a focus, and the focal control means which outputs the signal for carrying out focal control of said driving means based on the detected focal error signal, The rise electrical-potential-difference value which orders a value maintenance means and said driving means to perform the rise drive of said objective lens before holding the output signal of this focal control means, Or a driver voltage value supply means to supply the downward electrical-potential-difference value which orders a downward drive, Before [said] letting the low pass filter which passes the low-pass signal of the output signal of said before value maintenance means, and this low pass filter pass, the configuration which established an addition means to add said rise electrical-potential-difference value or said downward electrical-potential-difference value to the output signal of a value maintenance means is taken.
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0020
[Method of Amendment] Modification
[Proposed Amendment]
[0020] On the other hand, the tracking error signal generated by the digital disposal circuit 7 is supplied to the tracking control circuit 9, and generates the driving signal for the feedback control of the direction of tracking of pickup 3 in the tracking control circuit 9. The driving signal of this pickup 3 is supplied to the pickup 3 interior, thereby, pickup 3 is minutely controlled in the direction of tracking, and realizes tracking control of the feedback loop, and maintains the condition of being always on the pit in the recording surface of a disk 1.

[Translation done.]